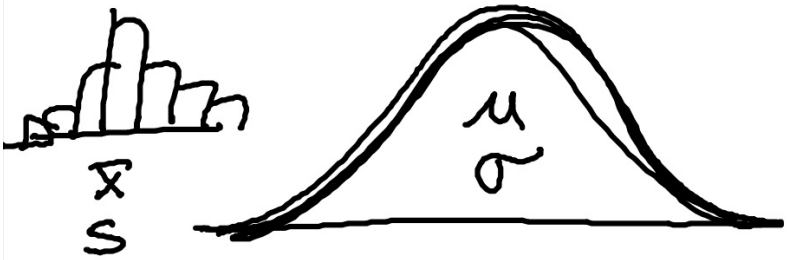
3.2 notes

NORMAL CURVE:

Shape: UNIMODAL & SYMMETRIC (bell curve)



Ex: heights
weights
test scores

Described by... mean & standard deviation (since it's symmetric)

Mean shows... the center of the curve

Standard deviation shows... the spread of the curve

$\bar{x} = 72.3\%$

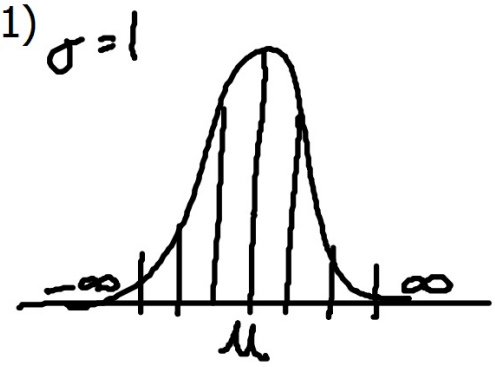
$\mu = 75\%$

Describes a population.... μ = population mean

Sigma = σ σ = population standard deviation

Examples of curves:

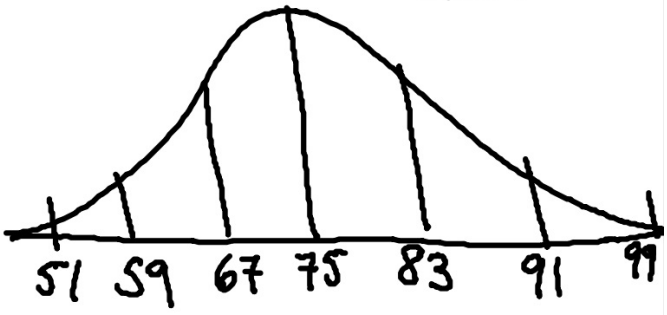
(1)



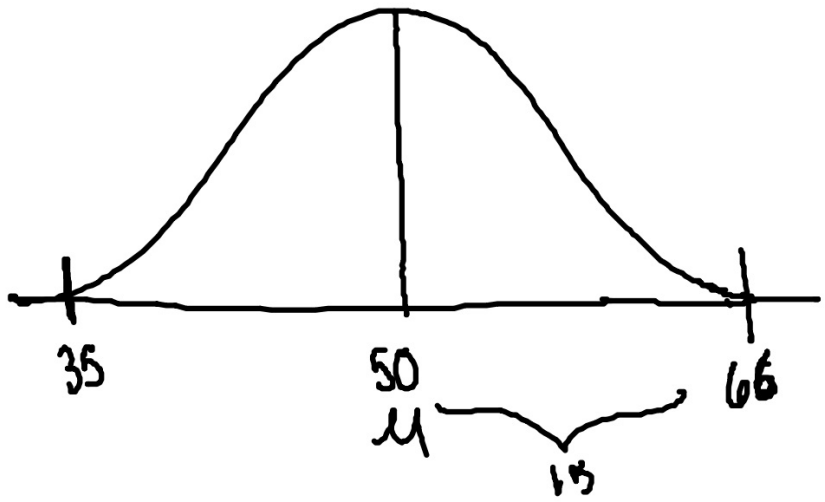
(2)

(3)

Ex: $\mu = 75$
$\sigma = 8$



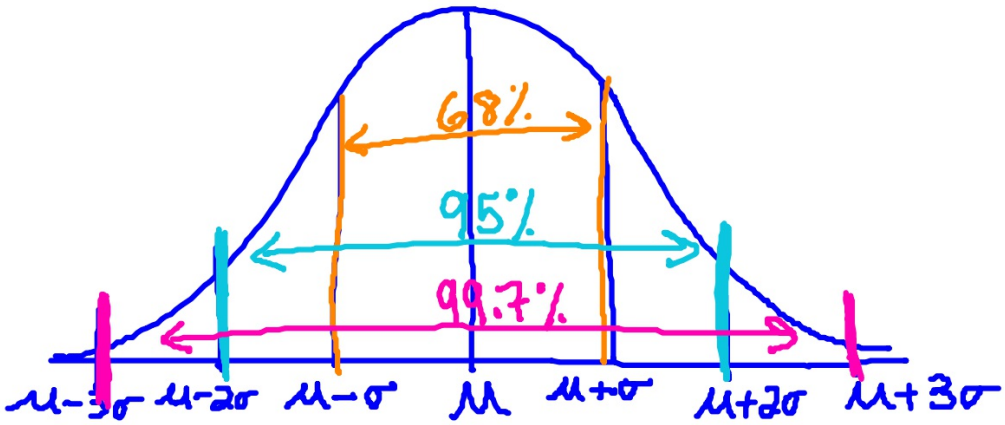
Approximating the Std. Deviation:



$\sigma = ?$

The 68-95-99.7% rule On a N(μ , σ) curve

Picture:

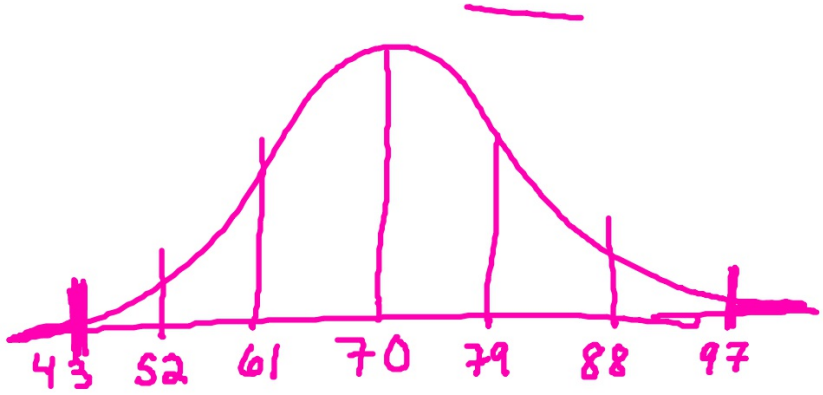


68 % of the data is within $\mu \pm \sigma$

95 % of the data is within $\mu \pm 2\sigma$

99.7 % of the data is within $\mu \pm 3\sigma$

Example: Test scores on the Ch. 5 test have a mean of 70 and a standard deviation of 9. Draw the normal curve below:



What percent of the students scored between 61 and 79? 68%.

What percent of students scored between 52 and 88? 95%

What percent of students scored between 43 and 96? 99.7%

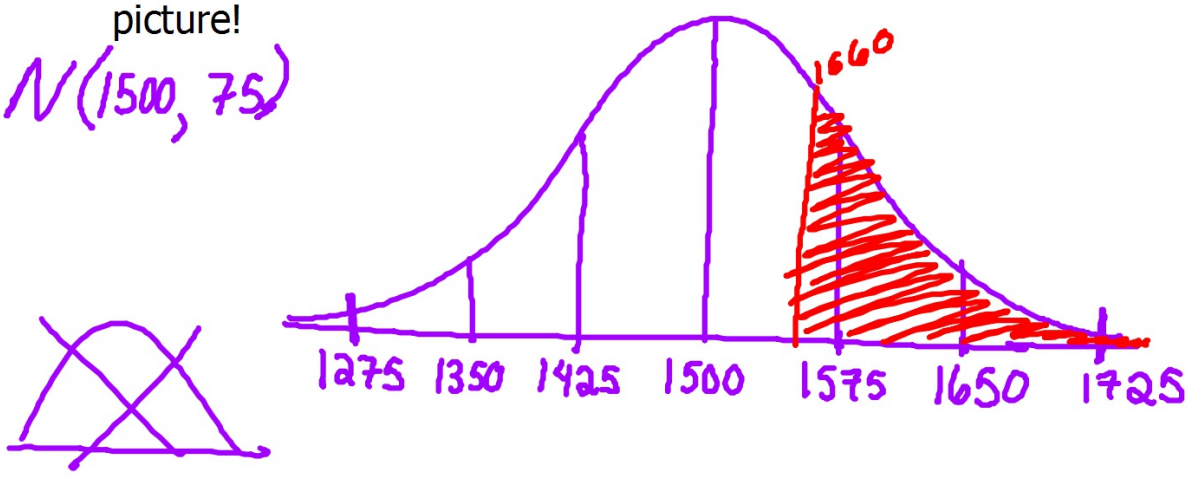
What percent of students scored below 43 or above 97? 0.3%

Examples:

1) The life expectancy of a particular brand of light bulb is normally distributed with a mean of 1500 hours and a standard deviation of 75 hours.

a. Sketch the picture of this normal curve below. Be sure to label the picture!

$N(1500, 75)$



b. What percent of the light bulbs last more than 1560 hours?

$P(X > 1560) =$

CALCULATOR:

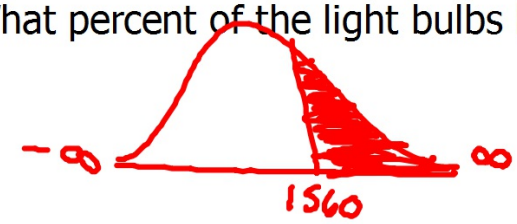
- Go to 2ND, then DISTR (the VARS button)

mean, std. dev.

NORMALCDF(lower bound, upper bound, μ, σ)

- Used for... finding % on a normal curve
- Infinity on the calculator... $E99 = \infty$ $-E99 = -\infty$
- NOTATION: $P(X \geq \ )$ $P(\_\_ < X < \_\_)$

b. What percent of the light bulbs last more than 1560 hours?



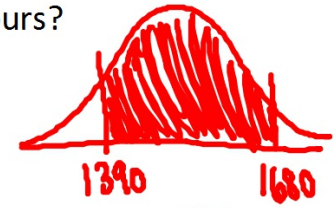
$P(x > 1560) = 21.19\%$

0.2119

N(1500, 75)

c. What percent of the light bulbs last between 1390 & 1680 hours?

$P(1390 < X < 1680) = 92.06\%$

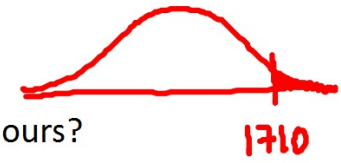


d. What percent of the light bulbs last less than 1400 hours?

$P(X < 1400) = 9.12\%$

e. What percent of the light bulbs last more than 1710 hours?

$P(X > 1710) = 0.26\%$

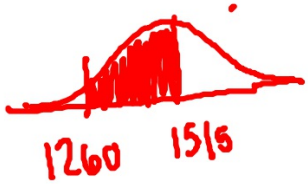


f. What percent of the light bulbs last between 1450 and 1660 hours?

$P(1450 < X < 1660) = 73.11\%$

g. What percent of the light bulbs last between 1260 and 1515 hours?

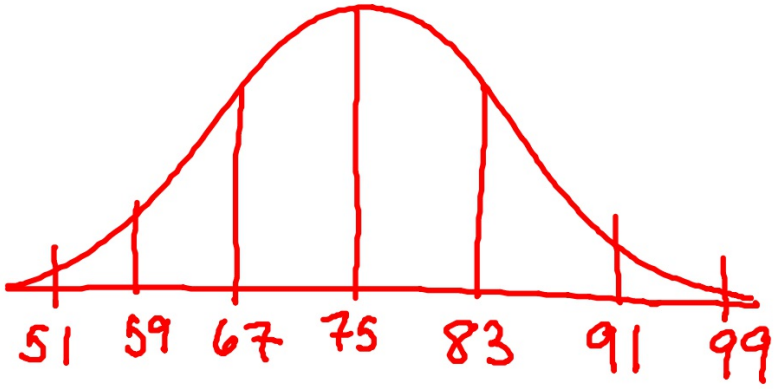
$P(1260 < X < 1515) = 57.86\%$



Example 3: Test scores. Average of 75, standard deviation of 8.

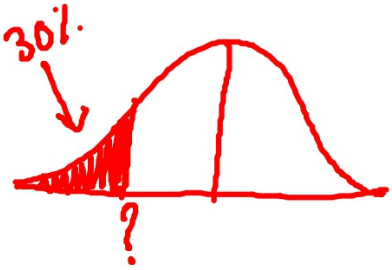
a. Draw the Normal Model and label

$N(75, 8)$



b. What score has 30% of the data below it?

$P(X < ?) = 30\%$



CALCULATOR:

INVNORM(% below #, μ, σ)

- Used for...

when given %, looking for a #

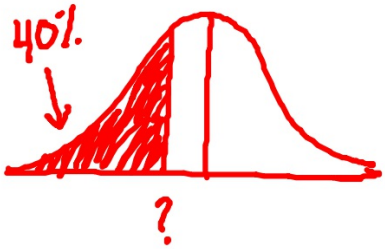
- Only does... % below #

b. What score has 30% of the data below it?

$P(X < ?) = 30\%$

$? = 70.80$ pts ← units

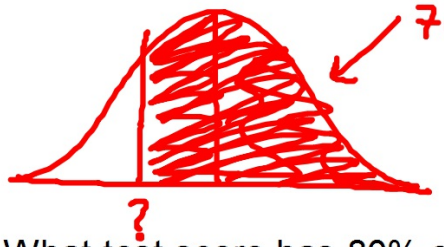
c. What test score has 40% of the data **below** it?



$P(x<?) = 40\%$

$? = 72.97$ pts.

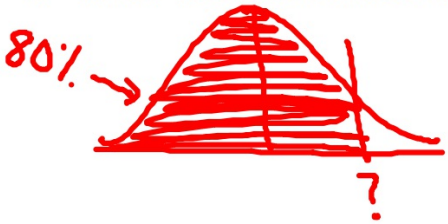
d. What test score has 70% of the class **above** it?



$P(x>?) = 70\%$

$P(x<?) = 30\%$

e. What test score has 80% of the data **below** it?



$P(x<?) = 80\%$

$? = 81.73$ pts

$? = 70.8$ pts

Examples: USE PROBABILITY NOTATION

1) The life expectancy of wood bats is normally distributed with a mean of 60 days and a standard deviation of 17 days.

a) Draw and label the normal model

b) What is the probability that a randomly chosen bat will last at least 60 days?

c) What percent of bats will last at least 70 days?

d) What percent of bats will last between 40 and 80 days?

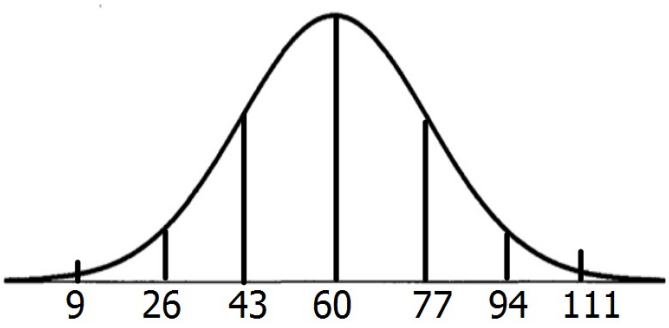
e) What is the probability that a bat will break during the first month (30 days)?

f) What percent of bats will last less than 40 days?

g) What amount of days do 40% of the bats last **longer** than?

h) What amount of days do 30% of the bats last **under**?

Answers to Example #1



b) $P(X > 60) = 50\%$

c) $P(X > 70) = 27.82\%$

d) $P(40 < X < 80) = 76.06\%$

e) $P(X < 30) = 3.88\%$

f) $P(X < 40) = 11.97\%$

g) $P(X < ?) = 60\%$ $? = 64.31$ days

h) $P(X < ?) = 30\%$ $? = 51.09$ days

Do examples 2 and 3 in the notes packet

2) N(16.1, 0.04)

a) $P(X > 16) = 0.9937 = 99.37\%$

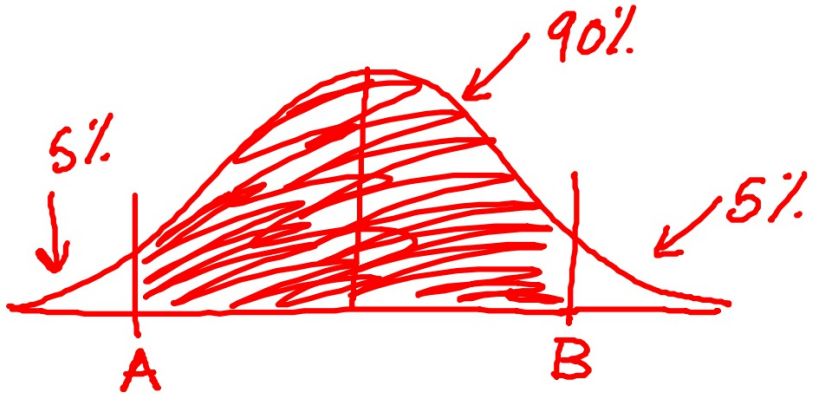
b) $P(X > 16.2) = 0.006 = 0.6\%$

c) $P(15.95 < X < 16.15) = 0.8943 = 89.43\%$

d) $P(X < 15.85) = 2.06 \times 10^{-10}$ $= 2.06 \times 10^{-8}\ \%$

e) $P(X < A) = 10\%$ $\quad A = 16.05$ oz

f) $P(X < A) = 20\%$ $\quad A = 16.07$ oz



$P(X < A) = 5\%$

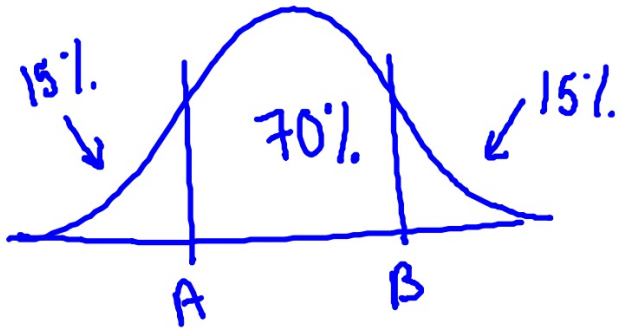
$A = 16.034$ oz.

$P(X < B) = 95\%$

$B = 16.166$ oz.

$N(16.1, 0.04)$ (middle)

#'s that have 70% btw. them



$P(X < A) = 15\%$

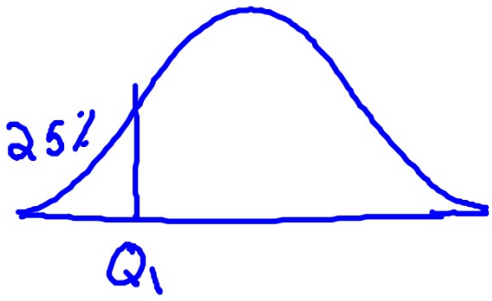
$A = 16.056607$

$P(X < B) = 85\%$

$B = 16.141 07$

$N(16.1, 0.04)$

Find Q_1



$P(X < Q_1) = 25\%$

$Q_1 = 16.073$ oz.

Find IQR

$IQR = Q_3 - Q_1$

$= 0.054$ oz

$P(X < Q_3) = 75\%$

$Q_3 = 16.127$ oz.

Complete the 3.2 HW worksheet